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REMARKS

Claims 1-7, and 23-27 are currently pending in the subject application and are presently under consideration. Claims 1, 6, and 7 have been amended. Additionally, claims 8-22 have been cancelled without prejudice or disclaimer and claims 32-34 have been newly added to further emphasize novel aspects of the invention and do not add any new matter. Previously presented claims 28-31 are withdrawn. A version of the claims is found at pages 2-5. Favorable reconsideration of the subject patent application is respectfully requested in view of the comments and amendments herein.

**I. Rejection of Claims 1-7 Under 35 U.S.C. §102(b)**

Claims 1-7 stand rejected under 35 U.S.C. §102(b) as being anticipated by Hanners (U.S. 6,128,188). Applicants' representative respectfully requests that this rejection be withdrawn for at least the following reasons. Hanners fails to describe each and every feature set forth in the subject claims.

A single prior art reference anticipates a patent claim only if it *expressly or inherently describes each and every limitation* set forth in the patent claim. *Trintec Industries, Inc. v. Top-U.S.A. Corp.*, 295 F.3d 1292, 63 USPQ2d 1597 (Fed. Cir. 2002); *See Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). *The identical invention must be shown in as complete detail as is contained in the ... claim.* *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The invention as claimed provides for regulating heat dissipation of an integrated circuit by employing a heat regulation device with a thermal structure network assembly. Each thermal structure can act as a heat conducting pathway for inducing heat into and/or dissipating heat away from the integrated circuit, thus creating a more uniform temperature gradient across the semiconductor body. To this end, independent claims 1 and 7 recite, *a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of a region of an integrated circuit semiconductor body*. Hanners fails to disclose or suggest these features of the claimed invention.

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Hanners discloses a self-balancing temperature control device for an IC that includes a heat sink attached to the IC having *thermomorphic* fins or vanes. The term thermo-morphic implies that the fins or vanes have a form that is dependent on the temperature. As such when the IC increases its heat output the fins or vanes in Hanners *warm up and change their shape* in a manner that increases the rate at which heat is removed from the IC. Thus, it is submitted that element 10 in Figure 1 from Hanners teaches a *thermo-morphic* device and not a **thermo-electrical** structure as stated by the Examiner in Page 2 of the Office Action dated December 28, 2005. Therefore, Hanners does not disclose or suggest the claimed feature of the invention wherein *a thermo-electrical* structure is capable of *inducing heat into and/or dissipating heat away from* a region of a semiconductor body as recited in applicants' claimed subject matter. Accordingly, this rejection with respect to independent claims 1, 7 and the claims that depend there-from should be withdrawn.

## **II. Rejection of Claims 1 and 7 Under 35 U.S.C. §102(b)**

Claims 1 and 7 stand rejected under 35 U.S.C. §102(b) as being anticipated by Levinson *et al.* (U.S. 6,098,408). Applicants' representative respectfully requests that this rejection be withdrawn for at least the following reasons. Levinson *et al.* fails to disclose or suggest all features of the subject claims.

As stated *supra*, independent claims 1 and 7 utilize *a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of a region of an integrated circuit semiconductor body*. Levinson *et al.* fails to suggest or teach such a thermo-electrical structure as recited in the subject claims. On the contrary, Levinson *et al.* discloses a system for regulating the temperature of a reticle utilized in a lithographic process. This system includes a chuck assembly having a backplate that is operatively coupled to a thermoelectric cooling system for regulating temperature of a portion of the reticle *via* heat conduction through the backplate. It is submitted that element 22 in Figure 1 in Levinson *et al.* is a reticle and not an integrated circuit semiconductor body in contrary to the Examiner's contention on page 3 of the Office Action dated December 28, 2005. A reticle is a mask that transfers a pattern onto a semiconductor wafer in a lithographic process. Therefore, it can be concluded that

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Levinson *et al.* does not disclose *a thermo-electrical structure that induces heat to and/or dissipates generated heat away from a portion of a region of an integrated circuit semiconductor body*. Hence, Levinson *et al.* does not anticipate the claimed invention. Applicants' representative respectfully requests that this rejection of claims 1 and 7 be withdrawn.

### **III. Rejection of Claims 1 and 7 Under 35 U.S.C. §102(b)**

Claims 1 and 7 stand rejected under 35 U.S.C. §102(b) as being anticipated by El-Husayni (U.S. 5,940,784). Applicants' representative respectfully requests that this rejection be withdrawn for at least the following reasons. El-Husayni fails to disclose or suggest all features of the claimed subject matter.

Independent claims 1 and 7 provide for a heat regulating device that uniformly regulates at least one of heat dissipation and/or heat induction by utilizing a thermo-electrical structure. In particular, the thermo-electric structure can act as a heat conducting pathway for inducing heat into and/or dissipating heat away from the integrated circuit semiconductor body. Independent claims 1 and 7 disclose *a heat regulating device for regulating a heat flow into and out of an integrated circuit semiconductor body that induces heat to and/or dissipates generated heat away from an integrated circuit semiconductor body utilizing a thermo-electrical structure*. El-Husayni fails to disclose or suggest these features of the claimed invention. El-Husayni discloses a heat flow meter instrument for measuring thermal properties of a specimen. Such apparatus includes two thermoelectric devices each of which is coupled to a hot plate, a cold plate, and a heat flow transducer thermally connectable to a specimen that measures heat flowing related therewith. The apparatus disclosed in El-Husayni characterizes different materials such as fiberglass, cellular foams, rubber polymers, ceramics *etc.* (See Column 4 || 23 – 26) and is not a heat-regulating device for an integrated circuit semiconductor body as recited in the subject claims. Hence, the test sample as seen in Figure 1A is one of these materials (*e.g.*, fiberglass, cellular foams, rubber polymers, ceramics *etc.*) and not a portion of an integrated circuit semiconductor body. Therefore, El-Husayni does not disclose or suggest thermoelectric structures that are used to *induce heat to and/or dissipate generated heat away from a portion of an*

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*integrated circuit semiconductor body*. In view of at least the foregoing, this rejection with respect to independent claims 1 and 7 should be withdrawn.

**IV. Rejection of Claims 1 and 7 Under 35 U.S.C. §102(b)**

Claims 1 and 7 stand rejected under 35 U.S.C. §102(b) as being anticipated by Ghoshal (U.S. 5,867,990). Applicants' representative respectfully requests that this rejection be withdrawn for at least the following reasons. Ghoshal fails to disclose or suggest all features of the claimed invention.

As discussed above, independent claims 1 and 7 recite *a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of an integrated circuit semiconductor body*. Ghoshal relates to Peltier devices that are dynamically enabled using pulses of electrical power while the thermal paths, between the cold and hot sides of the device are selectively switched so that the conduction state is responsive to the temperature dynamics within the device. However, Ghoshal is silent to the fact that these thermo-electrical structures can induce heat into and/or remove generated heat away from *a portion of an integrated circuit semiconductor body* as recited by independent claims 1 and 7. By utilizing the thermo-electrical structures to induce heat and/or remove generated heat from the integrated circuit semiconductor body, a uniform temperature gradient is created across the entire integrated circuit body by transferring heat from the portions with higher heat dissipation (hot spots) to other areas of the semiconductor body, which reduces the stress within the integrated circuit. As seen from Figure 7 of Ghoshal, the thermoelectric cooler cools an entire integrated circuit but does not address the localized heating problem within the semiconductor body of an integrated circuit. By reducing the stress within the body of an integrated circuit applicants' invention mitigates the need for additional cooling units like the one taught by Ghoshal. Therefore an identical invention as recited in the subject claims is not disclosed by the cited reference. In view of at least the foregoing it is respectfully requested that this rejection with respect to independent claims 1 and 7 should be withdrawn.

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**V. Rejection of Claims 1-7, 23, 25, and 26 Under 35 U.S.C. §102(e)**

Claims 1- 7, 23, 25 and 26 stand rejected under 35 U.S.C. §102(e) as being anticipated by Milke-Rojo *et al.* (U.S. 20050086948). Applicants' representative respectfully requests that this rejection be withdrawn for at least the following reasons. Milke-Rojo *et al.* fails to disclose all features of the claimed invention.

The invention as claimed provides for regulating heat dissipation of an integrated circuit by employing a heat regulation device with a thermal structure network assembly. Each thermal structure can act as a heat conducting pathway for inducing heat into and/or dissipating heat away from the integrated circuit, thus creating a more uniform temperature gradient across the semiconductor body. To this end, independent claims 1 and 7 recite *a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of an integrated circuit semiconductor body*. Milke-Rojo *et al.* fails to teach these novel aspects of the claimed invention. Milke-Rojo *et al.* relates to the field of medical devices, in particular, to an X-Ray detector with cooling capabilities. The cited reference teaches a temperature regulator that provides thermoelectric temperature control that can heat or cool an X-Ray detector. The temperature regulator maintains the temperature within the X-Ray detector by controlling current through a thermoelectric device. Applicants' representative asserts that element 208 in Figure 2 of Milke-Rojo *et al.* is an entire X-Ray panel of an X-Ray detector and not *a portion of an integrated circuit semiconductor body* as incorrectly contended by the Examiner on Page 5 of the Office Action dated December 28, 2005. In view of the foregoing, it is requested that this rejection of independent claims 1, 7 and all the claims that depend there-from be withdrawn.

**VI. Rejection of Claim 24 Under 35 U.S.C. §103(a)**

Claim 24 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Milke-Rojo *et al.* in view of Cannell *et al.* (U.S. 6,729,383). Withdrawal of this rejection is requested for at least the following reasons. The cited references, either alone or in combination, fail to teach or suggest all limitations of the subject claims.

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To reject claims in an application under §103, an examiner must establish a *prima facie* case of obviousness. A *prima facie* case of obviousness is established by a showing of three basic criteria. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second there must be a reasonable expectation of success. ***Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.*** See MPEP §706.02(j). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must be found in the prior art and not based on the Applicant's disclosure. See *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991) (emphasis added).

As stated *supra*, the invention as claimed provides for regulating heat dissipation of an integrated circuit by employing a heat regulation device with a thermal structure network assembly. Cannell *et al.* relates to methods and apparatuses for cooling electronic components and other objects. However, Cannell *et al.* does not make up for the aforementioned deficiencies of Milke-Rojo *et al.* with respect to independent claim 1 from which the subject claim depends. In particular, Cannell *et al.* does not teach ***a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of an integrated circuit semiconductor body.*** Therefore, the subject invention as recited in claim 24 is not obvious over a combination of Milke-Rojo *et al.* and Cannell *et al.* Therefore, it is respectfully submitted that this rejection be withdrawn.

#### **VII. Rejection of Claim 27 Under 35 U.S.C. §103(a)**

Claim 24 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Milke-Rojo *et al.* in view of Kwon *et al.* (U.S. 6,952,050). Withdrawal of this rejection is requested for at least the following reasons. The cited references, either alone or in combination, fail to teach or suggest all limitations of the subject claims.

As stated above, the claimed subject matter relates to a heat regulating device that uniformly regulates at least one of heat dissipation and/or heat induction by utilizing a thermo-electrical structure. Kwon *et al.* provides for a semiconductor package that

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absorbs thermal and mechanical stresses generated in interfaces between a chip, a thermal interface material, and a lid. However, Kwon *et al.* does not make up for the aforementioned deficiencies of Milke-Rojo *et al.* with respect to independent claim 1 from which the subject claim depends. In particular Kwon *et al.* does not teach *a thermo-electrical structure that induces heat to and /or dissipates generated heat away from a portion of an integrated circuit semiconductor body*. Therefore, the subject invention as recited in claim 27 is not obvious over a combination of Milke-Rojo *et al.* and Kwon *et al.* Consequently, applicants' representative respectfully requests this rejection be withdrawn.

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CONCLUSION

The present application is believed to be in condition for allowance in view of the above comments and amendments. A prompt action to such end is earnestly solicited.

In the event any fees are due in connection with this document, the Commissioner is authorized to charge those fees to Deposit Account No. 50-1063 [AMDP812US].

Should the Examiner believe a telephone interview would be helpful to expedite favorable prosecution, the Examiner is invited to contact applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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